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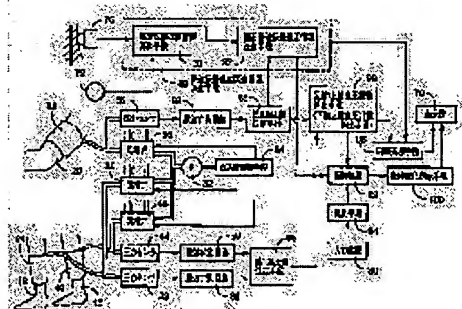
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### (54) LOWER/UPPER EXTREMITY BLOOD PRESSURE INDEX MEASURING APPARATUS

#### (57)Abstract:

PROBLEM TO BE SOLVED: To provide a lower/upper extremity blood pressure index measuring apparatus which, when a lower/upper extremity blood pressure index assumes a normal value, can determine whether or not that value is due to the advanced state of arteriosclerosis throughout the body.

SOLUTION: A simultaneous display means 98 displays a mark in a position defined by both a corrected pulse wave propagation velocity PWVc determined by a corrected pulse wave propagation velocity information determining means 92 and an ankle/above-elbow blood pressure index AAI calculated by an ankle/ above-elbow blood pressure index calculating means 96, on a two-dimensional graph consisting of an ankle/above-elbow blood pressure index (=AAI) axis and a corrected pulse wave propagation velocity axis on a display 70. Thus, since the AAI and the corrected pulse wave propagation velocity PWVc are displayed at the same time, when the corrected pulse wave propagation velocity PWVc assumes an abnormal value, the normal value of the AAI can be determined to be derived from the advanced state of arteriosclerosis throughout the body, even if the AAI is a normal value.



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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to evaluation of the membrum-inferius upper extremity blood-pressure characteristic measured especially about the membrum-inferius upper extremity blood-pressure characteristic measuring device for measuring a membrum-inferius upper extremity blood-pressure characteristic (the ratio of the blood-pressure value in the overarm to the blood-pressure value in an ankle, or ratio of the blood-pressure value in the ankle to the blood-pressure value in an overarm).

[0002]

[Description of the Prior Art] Although arteriosclerosis nature cardiovascular disease becomes the big cause of death by the advanced age woman, for example, a 65 or older-year woman, there is no easy general method of detecting latency arteriosclerosis. However, a membrum-inferius upper extremity blood-pressure characteristic is the simplicity and reproducible detection method of an artery-of-lower-extremity disease, and since the health condition of the cardiovascular system of the whole body can be inspected quickly and easily, in order to reduce the death rate and morbidity, it is known that it will be useful to identifying the individual who requires a special therapy.

[0003] As for a membrum-inferius upper extremity blood-pressure characteristic, it is common to be computed using the systolic blood pressure in an ankle by using the thing using the systolic blood pressure in an overarm, i.e., an ankle / overarm blood-pressure characteristic, (referred to as AnKle/Arm Blood Pressure Index = AAI, and API or ABI.) as a blood-pressure value of an upper extremity, and breaking the systolic blood pressure in an ankle by systolic blood pressure in an overarm as a blood-pressure value of the membrum inferius. And the diagnosis based on the ankle / overarm blood-pressure characteristic computed by making it such is performed by whether it is below the predetermined value with which its ankle / overarm blood-pressure characteristic was set about to 0.9.

[0004]

[Problem(s) to be Solved by the Invention] As mentioned above, although the membrum-inferius upper extremity blood-pressure characteristic represented by an ankle / overarm blood-pressure characteristic inspects an artery-of-lower-extremity disease, even if the artery-of-lower-extremity disease exists, a membrum-inferius upper extremity blood-pressure characteristic may show normal values. Namely, even if a constriction is in the bottom from an abdomen artery, when arteriosclerosis is progressing not only to the membrum inferius but to the whole body, the blood-pressure value in an ankle will become high, and, as for a membrum-inferius upper extremity blood-pressure characteristic, normal values will be shown.

[0005] The place which succeeds in this invention against the background of the above situation, and is made into the purpose has the value in offering the membrum-inferius upper extremity blood-pressure characteristic measuring device which can judge whether it is because arteriosclerosis is progressing to the whole body, when a membrum-inferius upper extremity blood-pressure characteristic is normal values.

[0006]

[Means for Solving the Problem] When also measuring the pulse-wave-velocity related information known in the membrum-inferius upper extremity blood-pressure characteristic measuring device as an index by which whenever [arteriosclerosis / of the whole body] can be evaluated as a result of repeating examination variously against the background of the above situation, this invention person found out that it could judge whether the value is because arteriosclerosis is progressing to the whole body, even if the membrum-inferius upper extremity blood-pressure characteristic was normal values. Based on such knowledge, it succeeds in this invention. In addition, the above-mentioned pulse-wave-velocity related information means the pulse-wave-velocity information meaning pulse wave velocity and the pulse wave propagation time, and the amendment pulse-wave-velocity information which amended the pulse-wave-velocity information to the value in a predetermined blood-pressure value.

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[0007] Namely, a 1st blood-pressure value decision means to determine the 1st blood-pressure value [ in / in the place made into the summary of this invention / a living body's membrum inferius ], A 2nd blood-pressure value decision means to determine the 2nd blood-pressure value in the living body's upper extremity, A membrum-inferius upper extremity blood-pressure characteristic calculation means to compute a membrum-inferius upper extremity blood-pressure characteristic based on the 2nd blood-pressure value determined by the 1st blood-pressure value determined by the 1st blood-pressure value decision means, and its 2nd blood-pressure value decision means, It is the membrum-inferius upper extremity blood-pressure characteristic measuring device equipped with the drop which displays the membrum-inferius upper extremity blood-pressure characteristic. (a) A pulse-wave-velocity related information decision means to determine the pulse-wave-velocity related information relevant to the pulse wave velocity to which a pulse wave spreads between said living body's predetermined 2 parts, (b) It is in including a coincidence display means to display the pulse-wave-velocity related information determined by the pulse-wave-velocity related information decision means on said drop at the membrum-inferius upper extremity blood-pressure characteristic computed by said membrum-inferius upper extremity blood-pressure characteristic calculation means, and coincidence.

[0008]

[Effect of the Invention] If it does in this way, while a membrum-inferius upper extremity blood-pressure characteristic will be computed by the membrum-inferius upper extremity blood-pressure characteristic calculation means based on the 2nd blood-pressure value determined by the 1st blood-pressure value and the 2nd blood-pressure value decision means which were determined by the 1st blood-pressure value decision means, the pulse-wave-velocity related information relevant to the pulse wave velocity to which a pulse wave spreads between a living body's predetermined 2 parts is determined by the pulse-wave-velocity related information decision means. And with a coincidence display means, since the pulse-wave-velocity related information is displayed on a membrum-inferius upper extremity blood-pressure characteristic and coincidence by the drop, when pulse-wave-velocity related information is outlying observation, even if a membrum-inferius upper extremity blood-pressure characteristic is normal values, since arteriosclerosis is progressing to the whole body, it can be judged that the membrum-inferius upper extremity blood-pressure characteristic became normal values.

[0009]

[Other modes of invention] Suitably here said membrum-inferius upper extremity blood-pressure characteristic measuring device (c) A discernment means to identify said living body by which said membrum-inferius upper extremity blood-pressure characteristic is measured, (d) Storage which was identified by the discernment means and which memorizes said membrum-inferius upper extremity blood-pressure characteristic and said pulse-wave-velocity related information for every living body, (e) This pulse-wave-velocity related information determined by this membrum-inferius upper extremity blood-pressure characteristic computed by said membrum-inferius upper extremity blood-pressure characteristic calculation means, and said pulse-wave-velocity related information decision means, An aging display means to display possible [ contrast of the living body's past membrum-inferius upper extremity blood-pressure characteristic and pulse-wave-velocity related information which are memorized by said storage ] is included further. If it does in this way, since the membrum-inferius upper extremity blood-pressure characteristic and pulse-wave-velocity related information which were measured this time, and the living body's past membrum-inferius upper extremity blood-pressure characteristic and pulse-wave-velocity related information will be displayed on a drop possible [ contrast ] by the aging display means, there is an advantage which the speed of advance of the arteriosclerosis of an artery-of-lower-extremity constriction and the whole body can recognize easily.

[0010] Moreover, said coincidence display means displays the mark on the location which becomes settled by the pulse-wave-velocity related information determined by the membrum-inferius upper extremity blood-pressure characteristic computed by said membrum-inferius upper extremity blood-pressure characteristic calculation means, and said pulse-wave-velocity related information decision means on the 2-dimensional flat surface which consists of a membrum-inferius upper extremity blood-pressure characteristic shaft and a pulse-wave-velocity related information shaft suitably. If it does in this way, it glances and there is an advantage which can perform evaluation of a membrum-inferius upper extremity blood-pressure characteristic and evaluation of pulse-wave-velocity related information.

[0011] Moreover, said aging display means displays the mark on the location which becomes settled by this membrum-inferius upper extremity blood-pressure characteristic and this pulse-wave-velocity related information on the 2-dimensional flat surface which consists of a membrum-inferius upper extremity blood-pressure characteristic shaft and a pulse-wave-velocity related information shaft, and the location which becomes settled by the living body's past membrum-inferius upper extremity blood-pressure characteristic and pulse-wave-velocity related information which were memorized by said storage suitably, respectively. If it does in this way, it glances and there is an advantage which can recognize the speed of advance of the arteriosclerosis of an artery-of-lower-extremity constriction and the whole body.

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[0012]

[The gestalt of suitable implementation of invention] Hereafter, one example of this invention is explained to a detail based on a drawing. Drawing 1 is a block diagram explaining the configuration of the ankle / overarm blood-pressure characteristic measuring device 10 with which this invention was applied. That is, an ankle / overarm blood-pressure characteristic measuring device 10 is membrum-inferius upper extremity blood-pressure characteristic measuring devices with which the ankle was chosen as membrum inferius and the overarm was chosen as an upper extremity. In addition, the measurement by this ankle / overarm blood-pressure characteristic measuring device 10 -- an overarm and an ankle -- abbreviation -- a patient is measured at least for proneness in the state of either - lateral position and a lateral position so that it may become the same height.

[0013] In drawing 1, an ankle / overarm blood-pressure characteristic measuring device 10 is equipped with the 2nd blood-pressure-measurement equipment 22 grade which measures the blood pressure in the 1st blood-pressure-measurement equipment 14 of a right leg side which measures the blood pressure in the right leg neck 12, the 1st blood-pressure-measurement equipment 18 of a left leg side which measures the blood pressure in the left leg neck 16, and an overarm 20, and is constituted.

[0014] The 1st blood-pressure-measurement equipment 14 of a right leg side is equipped with the cuff 24 which has rubber bag manufacture in the band-like bag made of cloth, and is wound around a patient's right leg neck 12, and the pressure sensor 28 connected to this cuff 24 through piping 26, respectively, a change-over valve 30 and an air pump 32. This change-over valve 30 is constituted so that it may be switched to three conditions, the pressure supply condition of permitting supply of the pressure into a cuff 24, the \*\*\*\* exhaust-gas-pressure condition which carries out exhaust gas pressure of the inside of a cuff 24 gradually at the rate of arbitration, and the rapid exhaust-gas-pressure condition which carries out exhaust gas pressure of the inside of a cuff 24 quickly.

[0015] It is the pressure signal SP 1 with which a pressure sensor 28 detects the pressure in a cuff 24, and the pressure is expressed. The static pressure discriminator 34 and the pulse wave discriminator 36 are supplied, respectively. The static pressure discriminator 34 is equipped with a low pass filter, and it is the pressure signal SP 1. Cuff pressure signal SK 1 showing the steady pressure 1, i.e., cuff pressure PC, contained It discriminates and is the cuff pressure signal SK 1. An electronic control 38 is supplied through the A/D converter which is not illustrated.

[0016] The above-mentioned pulse wave discriminator 36 is equipped with a band pass filter, and it is the pressure signal SP 1. Pulse wave signal SM 1 which is an oscillating component It discriminates in frequency and is the pulse wave signal SM 1. An electronic control 38 is supplied through the A/D converter which is not illustrated.

[0017] The 1st blood-pressure-measurement equipment 18 of a left leg side is equipped with the cuff 40 which has the same configuration as that with which said 1st blood-pressure-measurement equipment 14 of a right leg side was equipped, piping 42, a pressure sensor 44, and a change-over valve 46, and the change-over valve 46 is connected to said air pump 32. And it is the pressure signal SP 2 with which a pressure sensor 44 expresses the pressure in a cuff 40. The static pressure discriminator 48 and the pulse wave discriminator 50 which have the same configuration as that with which said right leg side blood-pressure-measurement equipment 14 was equipped are supplied, respectively. The static pressure discriminator 48 is the pressure signal SP 2. Cuff pressure signal SK 2 showing the steady pressure 2, i.e., cuff pressure PC, contained It discriminates and is the cuff pressure signal SK 2. An electronic control 38 is supplied through the A/D converter which is not illustrated. The pulse wave discriminator 50 is the pressure signal SP 2. Pulse wave signal SM 2 which is an oscillating component It discriminates in frequency and is the pulse wave signal SM 2. An electronic control 38 is supplied through the A/D converter which is not illustrated.

[0018] The 2nd blood-pressure-measurement equipment 22 is equipped with the piping 54 which has the same configuration as the cuff 52 which is constituted like said cuffs 24 or 40, and is wound around a patient's overarm section 20 (for example, overarm section of a right arm), and the thing with which said 1st blood-pressure-measurement equipment 14 of a right leg side was equipped, a pressure sensor 56, and a change-over valve 58, and the change-over valve 58 is connected to said air pump 32. And it is the pressure signal SP 3 with which a pressure sensor 56 expresses the pressure in a cuff 52. The static pressure discriminator 60 and the pulse wave discriminator 62 which have the same configuration as that with which said 1st blood-pressure-measurement equipment 14 of a right leg side was equipped are supplied, respectively. The static pressure discriminator 60 is the pressure signal SP 3. Cuff pressure signal SK 3 showing the steady pressure 3, i.e., cuff pressure PC, contained It discriminates and is the cuff pressure signal SK 3. An electronic control 38 is supplied through the A/D converter which is not illustrated. The pulse wave discriminator 62 is the pressure signal SP 3. Pulse wave signal SM 3 which is an oscillating component It discriminates in frequency and is the pulse wave signal SM 3. An electronic control 38 is supplied through the A/D converter which is not illustrated.

[0019] The above-mentioned electronic control 38 consists of so-called microcomputers equipped with CPU64, ROM66, RAM68, the I/O Port that is not illustrated. By performing signal processing, using the memory storage

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function of RAM68 for CPU64 and ROM66 according to the program memorized beforehand While outputting a driving signal from an I/O Port and controlling an air pump 32 and three change-over valves 30, 46, and 58, the contents of a display of a drop 70 are controlled.

[0020] A microphone 72 detects the heartbeat which is stuck at least on the predetermined heartbeat detecting element located right above the apex of heart, the 4th interspace left sternal border, the 2nd interspace left sternal border, the 2nd interspace sternum right margin of heart, the 4th interspace sternum right margin of heart, etc. on the epidermis of the center of a thorax with the adhesive tape which is not illustrated, and is transmitted to it at the skin like the heartbeat detecting element. Since it generates at the time of ejection initiation of the blood from the heart to a main artery, and termination, this heartbeat expresses the pulse wave in the aortic maximum upstream section. Therefore, the microphone 72 is functioning as 1st pulse wave detection equipment.

[0021] The sound detected by the microphone 72 is changed and outputted to an electrical signal SH, i.e., a cardiac correspondence number, in the piezoelectric device with which the interior of a microphone 72 is equipped and which is not illustrated. After the cardiac correspondence number SH is amplified with the preamp which is not illustrated, it is supplied to an electronic control 38 through a filter 74, and the main amplifier and A/D converter which are not illustrated. The filter 74 is equipped with four kinds of filters which are not illustrated, the low frequency component of the cardiac correspondence number SH declines, and a loud-sound component is emphasized so that four kinds of the filter may be changed at any time and may become close to human being's acoustic sense. Drawing 2 is drawing showing an example of the phonocardiogram detected with a microphone 72, and I sound based on closing of a mitral valve and disconnection of an aortic valve, II sound based on closing of an aortic valve, etc. exist in a heartbeat.

[0022] At least the downstream of the 1st pulse wave detection equipment is equipped with the carotid pulse wave sensor 76. It is what functions as 2nd pulse wave detection equipment which detects the pulse wave which spreads the inside of the artery of the wearing part. Have the sway sensor which detects vibration of the tip press section and which is not illustrated, and it is equipped so that a carotid artery 78 may be pressed in a living body's cervix. Signal SM 4 with which the carotid pulse wave generated from the carotid artery 78 is detected, and the carotid pulse wave is expressed An electronic control 38 is supplied through the A/D converter which is not illustrated. An example of the carotid pulse wave detected by the carotid artery sensor 76 is shown in drawing 2. In addition, a carotid artery 78 is a comparatively big path, and since it is directly linked with a main artery, it carries out abbreviation coincidence of the configuration of a carotid pulse wave with the configuration of a main artery wave.

[0023] It has the keyboard which is not illustrated, the ID number determined for every patient by the keyboard is inputted, and an input device 80 outputs the signal showing the inputted ID number to an arithmetic sequence unit 38. A store 82 is constituted by the store good [ a magnetic disk, a magnetic tape, volatile semiconductor memory, or / non-volatile ] and known, and memorizes the ankle / overarm blood-pressure characteristic (= AAI), and pulse-wave-velocity related information which were computed and determined with the arithmetic sequence unit 38 to a predetermined storage region.

[0024] Drawing 3 is a functional block diagram explaining the important section of the control function of the above-mentioned electronic control 38. The cuff pressure control means 84 controls three change-over valves 30, 46, and 58 connected to an air pump 32 and it, and to the predetermined target preasure force value PCM (for example, pressure value of 180mmHg extent), the rapid pressure up of the compression pressure force of three cuffs 24, 40, and 52 is carried out, and it carries out \*\*\*\* pressure lowering at the rate of 3 mmHg/sec extent after that.

[0025] In the process in which the cuff 24 wound around the right leg neck 12 is made to carry out \*\*\*\* pressure lowering of the 1st blood-pressure value decision means 86 by the cuff pressure control means 84 Pulse wave signal SM 1 by which sequential extraction is carried out Blood-pressure value [ in / using the oscillometric method which was easy to be based on change of the amplitude of the pulse wave to express, and was known / a right leg neck ] BP, i.e., 1st blood-pressure value BPof right leg side, 1R While determining Pulse wave signal SM 2 in which sequential extraction is carried out by the cuff pressure control means 84 in the process made [ the cuff 40 wound around the left leg neck 16 ] to carry out \*\*\*\* pressure lowering The oscillometric method which was easy to be based on change of the amplitude of the pulse wave to express, and was known is used, and it is 1st blood-pressure value BPof left leg side 1L. It determines. above-mentioned 1st blood-pressure value BPof right leg side 1R \*\*\*\* -- highest-blood-pressure value BP1RSYS, lowest-blood-pressure value BP1RDIA, etc. contain -- having -- above-mentioned 1st blood-pressure value BPof left leg side 1L \*\*\*\* -- highest-blood-pressure value BP1LSYS, lowest-blood-pressure value BP1LDIA, etc. are contained. 1st blood-pressure value BPof following side and right leg side 1R 1st blood-pressure value BPof left leg side 1L Especially when not distinguishing, it is only called the 1st blood-pressure value BP1.

[0026] The 2nd blood-pressure value decision means 88 determines the 2nd blood-pressure values BP2 (highest-blood-pressure value BP2SYS, lowest-blood-pressure value BP2DIA, etc.) using the oscillometric method which was easy to be based on change of the amplitude of the pulse wave which the pulse wave signal SM 3 by which sequential

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extraction is carried out expresses, and was known by the cuff pressure control means 84 in the process made [ the cuff 52 wound around the overarm 20 ] to carry out \*\*\*\* pressure lowering.

[0027] A pulse-wave-velocity information calculation means 90 to function as a pulse-wave-velocity related information decision means 89 computes serially the pulse-wave-velocity information relevant to the propagation velocity of the pulse wave based on the time difference from the predetermined part generated for every period of the 1st pulse wave detected by the 1st pulse wave detection equipment to the predetermined part generated for every period of the 2nd pulse wave detected by the 2nd pulse wave detection equipment. For example, the time of the start point of a second heart sound II being detected by the time difference DT 72, i.e., a microphone, shown in drawing 2 (at this time) In accordance with the point of being detected, the point, i.e., the notch, which the amplitude changes to an increment in a main artery wave after the amplitude decreases rapidly It has a time difference calculation means to compute serially the time difference (pulse wave propagation time) DT until the notch of a carotid pulse wave is detected by the carotid pulse wave sensor 76. Propagation velocity PWV (m/sec) of the pulse wave which spreads the inside of the artery of an operating personnel-ed from the formula 1 memorized beforehand based on the time difference DT serially computed by the time difference calculation means It computes serially. In addition, in a formula 1, L (m) is the distance to the part where it is equipped with the carotid pulse wave sensor 76 through a main artery from the ventriculus sinister, and the constant value calculated experimentally beforehand is used.

[0028]

[Equation 1]  $VM = L/DT$  [0029] An amendment pulse-wave-velocity information decision means 92 to function as a pulse-wave-velocity related information decision means 89 as well as the above-mentioned pulse-wave-velocity information calculation means 90 determines the amendment pulse-wave-velocity information which amended the pulse-wave-velocity information computed by the pulse-wave-velocity information calculation stage 90 to the value in the blood-pressure value (for example, 80mmHg(s)) set up beforehand. Generally this amendment pulse-wave-velocity information is known as an index by which whenever [ arteriosclerosis / of the whole body ] can be evaluated, and the conventional various means are used. For example, the means of following \*\* and \*\* is used. \*\* Compute pulse-wave-velocity information based on the blood-pressure value BP determined by blood-pressure value decision means to determine the blood-pressure value in the predetermined part of the living body of the 1st blood-pressure value decision means 86 or 2nd blood-pressure value decision means 88 grade. \*\* Compute amendment pulse-wave-velocity information using the relation which determines amendment pulse-wave-velocity information from pulse-wave-velocity information and the blood-pressure related information changed in relation to fluctuation of blood pressure and which was set up beforehand from the pulse-wave-velocity information actually determined from said living body, and blood-pressure related information. Here, the precursive appearance period PEP, a heart rate HR, etc. until blood carries out ejection from the ventriculus sinister are contained in the above-mentioned blood-pressure related information from contraction initiation of the myocardium of the ventriculus sinister of between [ ET ] the ejection phases when blood has started that it is running from a living body's ventriculus sinister, and a living body.

[0030] When the above-mentioned \*\* determines amendment pulse-wave-velocity information, the nomogram [-izing / the relation of the lowest-blood-pressure value and pulse wave velocity which are shown in ROM66 at drawing 4 / the nomogram / the \*\* type ] is memorized. Lowest-blood-pressure value BPDIA actually determined by said blood-pressure value decision means and from the pulse wave velocity PWV actually computed by the pulse-wave-velocity information calculation means 90 The nearest related line is chosen from the nomogram memorized by the ROM66, and the value which the selected, related line shows in 80mmHg(s) is determined as the amendment pulse wave velocity PWVc. And the discernment means 94 memorizes the amendment pulse wave velocity PWVc to storage 82 for every patient identified based on the ID number supplied from an input unit 80.

[0031] The ankle / an overarm blood-pressure characteristic calculation means 96 to function as a membrum-inferius upper extremity blood-pressure characteristic calculation means The thing corresponding to the 1st blood-pressure value BP1 of the 2nd blood-pressure value BP2 determined by the 1st blood-pressure value BP1 and the 2nd blood-pressure value decision means 88 which were determined by the 1st blood-pressure value decision means 86 (for example, the 1st -- highest-blood-pressure value BP1SYS -- the 2nd -- highest-blood-pressure value BP2SYS corresponds) being based -- an ankle / overarm blood-pressure characteristic (it is called AAI below Ankle/Arm Blood Pressure Index .) It computes. For example, AAI is the value which broke the 1st blood-pressure value BP1 by the 2nd blood-pressure value BP2, or the value which broke the 2nd blood-pressure value BP2 by the 1st blood-pressure value BP1 conversely. And the AAI is memorized to storage 82.

[0032] The coincidence display means 98 displays at coincidence the pulse-wave-velocity information determined by the pulse-wave-velocity related information decision means 89, and AAI computed by the ankle / overarm blood-pressure characteristic calculation means 96 on a drop 70. For example, the pulse-wave-velocity related information (numeric value) and AAI (numeric value) are displayed on a drop 70 side by side at coincidence. Or the mark is

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displayed on the location which shows actual AAI and pulse-wave-velocity related information on the 2-dimensional flat surface which consists of the ankle / an overarm blood-pressure characteristic shaft displayed on the drop 70, and a pulse-wave-velocity related information shaft.

[0033] The aging display means 100 displays the mark on the location which becomes settled by AAI and pulse-wave-velocity related information of the past about this operating personnel which were memorized in the predetermined storage region of storage 82 on the 2-dimensional flat surface where the mark with which this AAI and pulse-wave-velocity related information are expressed with said coincidence display means 98 was displayed. In addition, the pulse-wave-velocity related information of the above-mentioned past is determined when AAI of the above-mentioned past is computed. Moreover, although the same mark as the mark showing this value may be used for the mark showing the value of the above-mentioned past, the mark showing this value and a different mark are used so that it can distinguish from the mark showing this value suitably.

[0034] Drawing 5 is a flow chart explaining the important section of control actuation of the above-mentioned arithmetic sequence unit 38. In drawing 5, it is first judged at step S1 (a step is skipped hereafter.) corresponding to the discernment means 94 whether a patient's ID number was inputted from the input unit 80. While this decision is denied, it is made to stand by by performing this S1 repeatedly. And when a patient's ID number is inputted and decision of S1 is affirmed, S2 thru/or S4 corresponding to the cuff pressure control means 84 is performed. When three change-over valves 30, 46, and 58 are switched to a pressure supply condition and an air pump 32 drives in S2, the rapid pressure up of three cuffs 24, 40, and 52 is started, and they are all cuff pressure PCs of three cuffs 24, 40, and 52 at S3. It is judged whether it became more than the target compression pressure PCM beforehand set as 180mmHg extent. It is cuff pressure PC by performing less than [ above-mentioned / S2 ] repeatedly, when this decision of S3 is denied. A rise is continued.

[0035] And cuff pressure PC If decision of the above S3 is affirmed by rise, at continuing S4, an air pump 32 will be suspended, and change-over valves 30, 46, and 58 will be switched to a \*\*\*\* exhaust-gas-pressure condition, and it will be dropped at the loose rate which are each cuff 24 and 40 and 3 mmHg/sec extent as which the pressure in 52 was determined beforehand.

[0036] next, in S5 corresponding to the pulse-wave-velocity information calculation means 90, from the time of initiation of a second heart sound being detected by the microphone 72 The time difference of the time of the notch of a carotid pulse wave being detected by the carotid pulse wave sensor 76, Namely, the pulse wave propagation time DT to which a pulse wave spreads even the part where it was equipped with the carotid pulse wave sensor 76 from the heart is computed, and pulse wave velocity PWV is further computed by the pulse wave propagation time DT being substituted for said formula 1.

[0037] Next, the blood-pressure value decision routine of S6 corresponding to the 1st blood-pressure value decision means 86 and the 2nd blood-pressure value decision means 88 is performed. Namely, pulse wave signal SM 1 serially supplied from the pulse wave discriminator 36 The amplitude of the cuff pulse wave to express is determined for every beat. Based on change of the amplitude, 1st highest-blood-pressure value BPof right leg side1RSYS etc. is determined according to the blood-pressure value decision algorithm of an oscillograph metric method known well. Pulse wave signal SM 2 which similarly is supplied from the pulse wave discriminator 50 It is based on change of the amplitude of the cuff pulse wave to express. According to the blood-pressure value decision algorithm of an oscillograph metric method, 1st highest-blood-pressure value BPof left leg side1LSYS etc. is determined. pulse wave signal SM 3 supplied from the pulse wave discriminator 62 change of the amplitude of the cuff pulse wave to express -- being based -- the blood-pressure value decision algorithm of an oscillograph metric method -- following -- the 2nd -- highest-blood-pressure value BP2SYS and 2nd lowest-blood-pressure value BP2DIA etc. -- it is determined.

[0038] After the decision of all blood-pressure values is completed in the blood-pressure value decision routine of the above S6, the inside of all the cuffs 24 and 40 and 52 is made to carry out exhaust gas pressure quickly in S7 corresponding to the continuing cuff pressure control means 84 by switching three change-over valves 30, 46, and 58 to a rapid exhaust-gas-pressure condition.

[0039] In S8 corresponding to the continuing amendment pulse-wave-velocity information decision means 92 The inside of two or more related lines of the nomogram shown in drawing 4 memorized by ROM66, 2nd lowest-blood-pressure value BP2DIA determined by the pulse wave velocity PWV computed by said S5, and the above S6 One nearest related line is chosen from the point which becomes settled, and the value which the selected, related line shows in 80mmHg(s) is determined as the amendment pulse wave velocity PWVc.

[0040] In S9 corresponding to the continuing ankle / overarm blood-pressure characteristic calculation means 96 the 2nd as which 1st highest-blood-pressure value BPof right leg side1RSYS determined by said S6 was similarly determined by said S6 -- highest-blood-pressure value BP2SYS being divided -- AAIR by the side of a right leg While being computed 1st highest-blood-pressure value BPof left leg side1LSYS determined by said S6 -- the above 2nd --

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highest-blood-pressure value BP2SYS being divided -- AAIL by the side of a left leg It is computed.

[0041] And AAIR by the side of the right leg computed by the above-mentioned S9 in S10 continuing And AAIL by the side of a left leg It memorizes for every patient in the predetermined storage region of storage 82 with the amendment pulse wave velocity PWVc computed by said S8.

[0042] Right leg side AAIR computed by said S9 in S11 corresponding to the continuing coincidence display means 98 on the 2-dimensional graph 106 which consists of the AAI shaft 102 and the amendment pulse-wave-velocity shaft 104 on the display screen of a drop 70 as shown in drawing 6 And left leg side AAIL "-" is displayed on the location determined with the amendment pulse wave velocity PWVc computed by said S8 as the value of a low side inside. In addition, in order that the background color of the above-mentioned 2-dimensional graph 106 may make a diagnostic result much more intelligible The range beforehand determined based on the experiment as the range (0.9 or less) beforehand determined based on the experiment as abnormality range of AAI, and abnormality range of the amendment pulse wave velocity PWVc (more than 1000 (cm/sec)), AAI and the range where both the amendment pulse wave velocity PWVc is normal are expressed as a different color.

[0043] AAIR of the past memorized by storage 82 in S12 corresponding to the continuing aging display means 100 about the patient identified by said S1 of the 2-dimensional graph 106 AAIL either -- the mark showing the past AAI and the amendment pulse wave velocity PWVc is displayed on the location which becomes settled with the amendment pulse wave velocity PWVc at that time the lower one. An example of the contents of a display about the patient this the measurement of whose is the 3rd time is shown, "\*\*\*" expresses the last measured value and "\*\*\*" expresses the measured value before last with the example of drawing 6 . Furthermore, in order to make a change inclination intelligible, it is connected with the arrow head between one mark and the mark which means the measured value of 1 time ago rather than the mark.

[0044] According to this example, as mentioned above, with an ankle / overarm blood-pressure characteristic calculation means 96 (S9) the 1st determined by the 1st blood-pressure value decision means 86 (S6) -- highest-blood-pressure value BP1SYS the 2nd determined by the 2nd blood-pressure value decision means 88 (S6) -- highest-blood-pressure value BP2SYS While AAI is computed by being divided The amendment pulse wave velocity PWVc relevant to the pulse wave velocity PWV to which a pulse wave spreads from the heart to a cervix with the amendment pulse-wave-velocity information decision means 92 is determined. And with the coincidence display means 98 (S11), since the amendment pulse wave velocity PWVc is displayed on AAI and coincidence on the 2-dimensional graph 106 of a drop 70, when the amendment pulse wave velocity PWVc is outlying observation, even if AAI is normal values, since arteriosclerosis is progressing to the whole body, it can be judged that AAI became normal values.

[0045] Moreover, according to this example, since AAI measured this time, AAI of the past of the amendment pulse wave velocity PWVc and its patient, and the amendment pulse wave velocity PWVc are displayed on the 2-dimensional graph 106 of a drop 70 by coincidence with the aging display means 100 (S12), there is an advantage which the speed of advance of the arteriosclerosis of an artery-of-lower-extremity constriction and the whole body can recognize easily.

[0046] According to this example, moreover, the coincidence display means 98 (S11) On the 2-dimensional graph 106 which consists of an AAI shaft 102 and an amendment pulse-wave-velocity shaft 104 Since the mark is displayed on the location which becomes settled with the amendment pulse wave velocity PWVc determined by AAI and the amendment pulse-wave-velocity information decision means 92 (S8) which were computed by the ankle / overarm blood-pressure characteristic calculation means 96 (S9) It glances and there is an advantage which can perform evaluation of AAI and evaluation of the amendment pulse wave velocity PWVc.

[0047] According to this example, moreover, the aging display means 100 (S12) The location which becomes settled with this AAI and this amendment pulse wave velocity PWVc on the 2-dimensional graph 106 which consists of an AAI shaft 102 and an amendment pulse-wave-velocity shaft 104, Since the mark is displayed on the location which becomes settled with AAI of the patient's past and the amendment pulse wave velocity PWVc which were memorized by storage 82, respectively, it glances and there is an advantage which can recognize the speed of advance of the arteriosclerosis of an artery-of-lower-extremity constriction and the whole body.

[0048] As mentioned above, although one example of this invention was explained based on the drawing, this invention is applied also in other modes.

[0049] For example, in the flow chart of drawing 5 of the above-mentioned example, although one shaft of the 2-dimensional graph 106 was the amendment pulse-wave-velocity PWVc shaft 104, it may be a shaft showing amendment pulse wave propagation-time DTc, pulse-wave-velocity PWV, and the pulse wave propagation time DT.

[0050] Moreover, although the 1st blood-pressure-measurement equipment 14 of a right leg side, the 1st blood-pressure-measurement equipment 16 of a left leg side, and the 2nd blood-pressure-measurement equipment 22 consisted of above-mentioned examples so that a blood-pressure value might be measured using an oscillometric

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method You may be what carries out blood pressure measurement with the so-called K sound method which measures a blood-pressure value based on the cuff pressure at the time of generating of Korotkoff sounds, and disappearance. It does not interfere, even if it carries out blood pressure measurement by the ultrasonic Doppler system which detects closing motion of the arterial canal with the ultrasonic wave oscillator and receiver which were put on right above [ of an artery ] by the process of the compression pressure of an artery.

[0051] moreover, in the flow chart of drawing 5 of the above-mentioned example, by S11 corresponding to the coincidence display means 98 AAIR computed in S9 AAIL Although the mark was displayed on the location which the value of a low side is chosen inside and determined with the selected value and amendment pulse wave velocity PWVc computed by S8 AAIR The location which becomes settled with the amendment pulse wave velocity PWVc, and AAIL The mark may be displayed on the both sides of the location which becomes settled with the amendment pulse wave velocity PWVc. Moreover, S12 corresponding to the aging display means 100 is the past AAIR. The location which becomes settled with the amendment pulse wave velocity PWVc, and the past AAIL The mark may be displayed on the both sides of the location which becomes settled with the amendment pulse wave velocity PWVc.

[0052] Moreover, in the flow chart of drawing 5 of the above-mentioned example, although the marks displayed on the 2-dimensional graph 106 were "-", "\*\*\*", and "\*\*\*", the mark of other configurations may be used for them. Moreover, by changing a color, each may be distinguished, the mark is the same and each may be distinguished in a subscript.

[0053] Moreover, 1st blood-pressure value BPof right leg side 1R [ in / at the above-mentioned example / the right leg neck 12 ] And 1st blood-pressure value BPof left leg side 1L in the left leg neck 16 Only either may be determined although determined.

[0054] Moreover, in the above-mentioned example, although the microphone 72 with which a living body's thorax is equipped was used as 1st pulse wave detection equipment in order to compute pulse-wave-velocity information, the electrocardio guide which detects continuously the electrocardio induction wave which shows the action potential of a myocardium through two or more electrodes stuck and stuck to a living body's predetermined part may be used as 1st pulse wave detection equipment. Moreover, \*\* by which either of the pressure sensors 44 connected to the cuff 40 and it which were wound around the pressure sensor 28 connected to the cuff 24 and it by which the pressure sensor 56 connected to the cuff 52 and it which were wound around the overarm 20 was used as 1st pulse wave detection equipment, and was wound around the right leg neck 12, or the left leg neck 16 was used as the 2nd pulse wave detection equipment is good. In addition, when a cuff 24 and pressure-sensor 28 grade are used as pulse wave detection equipment, the pressure in a cuff is the lowest-blood-pressure value BPDIA before blood pressure measurement or after blood pressure measurement. It considers as the pressure beforehand set up as a pressure low enough, and pulse-wave-velocity information is computed based on the pulse wave detected by the pressure sensor in the condition.

[0055] Moreover, although it had the input unit 80 which inputs a patient's ID number and the discernment means 94 was identifying the patient by the ID number inputted into the input unit 80 in the above-mentioned example It may have card reading equipment which reads the card with which the card was created for every patient, a patient may be identified based on the code for every patient written in the above-mentioned card, and a patient may be identified using the information on patient propers, such as a fingerprint and a voiceprint.

[0056] Moreover, although the ankle / overarm blood-pressure characteristic measuring device 10 of the above-mentioned example were membrum-inferius upper extremity blood-pressure characteristic measuring devices with which the ankle was chosen as membrum inferius and the overarm was chosen as an upper extremity, a femoral region or a tip of a foot may be chosen as membrum inferius, and a wrist or a fingertip may be chosen as an upper extremity.

[0057] In addition, in the range in which this invention does not deviate from the main point, modification may be added variously.

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## CLAIMS

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[Claim(s)]

[Claim 1] A 1st blood-pressure value decision means to determine the 1st blood-pressure value in a living body's membrum inferius, and a 2nd blood-pressure value decision means to determine the 2nd blood-pressure value in this living body's upper extremity, A membrum-inferius upper extremity blood-pressure characteristic calculation means to compute a membrum-inferius upper extremity blood-pressure characteristic based on the 2nd blood-pressure value determined by the 1st blood-pressure value and this 2nd blood-pressure value decision means which were determined by this 1st blood-pressure value decision means, A pulse-wave-velocity related information decision means to be the membrum-inferius upper extremity blood-pressure characteristic measuring device equipped with the drop which displays this membrum-inferius upper extremity blood-pressure characteristic, and to determine the pulse-wave-velocity related information relevant to the pulse wave velocity to which a pulse wave spreads between said living body's predetermined 2 parts, The membrum-inferius upper extremity blood-pressure characteristic measuring device characterized by including a coincidence display means to display the pulse-wave-velocity related information determined by this pulse-wave-velocity related information decision means on said drop at the membrum-inferius upper extremity blood-pressure characteristic computed by said membrum-inferius upper extremity blood-pressure characteristic calculation means, and coincidence [claim 2] A discernment means to identify said living body by which said membrum-inferius upper extremity blood-pressure characteristic is measured, The storage which was identified by this discernment means and which memorizes said membrum-inferius upper extremity blood-pressure characteristic and said pulse-wave-velocity related information for every living body, This pulse-wave-velocity related information determined by this membrum-inferius upper extremity blood-pressure characteristic computed by said membrum-inferius upper extremity blood-pressure characteristic calculation means, and said pulse-wave-velocity related information decision means, The membrum-inferius upper extremity blood-pressure characteristic measuring device according to claim 1 which is what includes further an aging display means to display possible [ contrast of this living body's past membrum-inferius upper extremity blood-pressure characteristic and pulse-wave-velocity related information which are memorized by said storage ].

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